NOTICE

All drawings located at the end of the document.

CLOSURE PLAN
Inactive Interim Status Facilities

ORIGINAL URANIUM CHIP ROASTER
SWMU # 204

U.S DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

October 3, 1988

Prepared By

ROCKWELL INTERNATIONAL
Aerospace Operations
Rocky Flats Plant

ROY F WESTON, INC

CHEN & ASSOCIATES, INC

ADMIN RECORD

Volume XX

CLOSURE PLAN
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CLOSURE PLAN

INACTIVE INTERIM STATUS FACILITIES

ORIGINAL URANIUM CHIP ROASTER, BUILDING 447
SWMU REFERENCE NUMBER 204

Prepared by:

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Prepared for:

U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado
October 3, 1988

CO7890010526

Date: October 3, 1988
Revision No. 1

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1.0 INTRODUCTION

1.1 Description of the Rocky Flats Plant

1.1.1 Location and Operator

The U.S. Department of Energy's Rocky Flats Plant is located in north-central Colorado, northwest of the City of Denver (Figure 1) The plant is located in Sections 1 through 4 and 9 through 15 of T. 2S., R. 70 W The facility's EPA identification number is CO7890010526. The mailing address is:

U.S. Department of Energy
Rocky Flats Plant
P.O. Box 928 Golden, Colorado 80402

The facility contact is:

Albert E. Whiteman, Area Manager
Phone: (303) 966-2025

The facility covers approximately 6,500 acres of federally owned land in northern Jefferson County, Colorado, which is centered at 105° 11' 30" west longitude, 39° 53' 30' north latitude The facility is approximately sixteen miles northwest of Denver and nine to twelve miles from the neighboring communities of Boulder, Broomfield, Golden and Arvada It is bounded on the north by State Highway 128, on the west by a parcel of land east of State

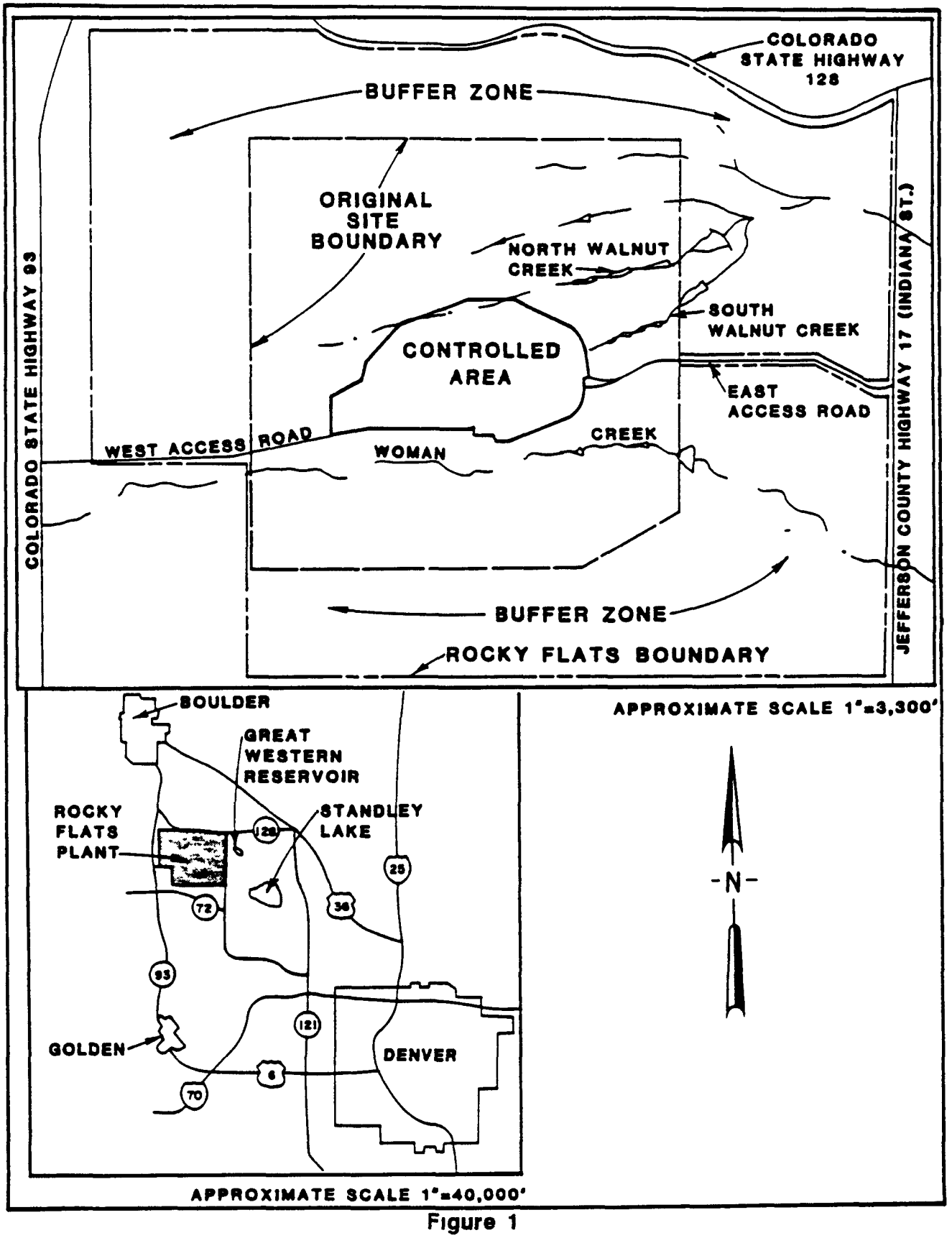


Figure 1

Vicinity Map

Highway 93, on the south by a parcel of land north of State Highway 72 and on the east by Jefferson County Highway 17. Access to the plant is from an east access road exiting from Jefferson County Highway 17 and a west access road exiting from State Highway 93.

The facility is situated at an elevation of approximately 6,000 feet. It is on the eastern edge of a geological bench known locally as Rocky Flats. The bench is approximately five miles wide and flanks the eastern edge of the foothills of the Rocky Mountains.

1.1.2 Mission

The Rocky Flats Plant is a government-owned and contractor-operated facility. It is part of a nationwide nuclear weapons research, development and production complex administered by the Albuquerque Operations Office of the U.S. Department of Energy (DOE). The prime operating contractor for the Rocky Flats Plant is Aerospace Operations of Rockwell International.

The facility produces metal components for nuclear weapons; therefore, its product is directly related to national defense The facility fabricates components from plutonium, uranium, beryllium and stainless steel Other production activities include chemical recovery and purification of recyclable

transuranic radionuclides, metal fabrication and assembly and related quality control function. Other activities include research and development in metallurgy, machining, non-destructive testing, coatings, remote engineering, chemistry and physics. Parts at the plant are shipped elsewhere for final assembly (U.S. Department of Energy, 1987a)

1.1.3 Brief History

Construction of the Rocky Flats Plant was approved by the U.S. Government in 1951 as an addition to the nation's nuclear weapons production complex. Operations began in 1952 under direction of the Atomic Energy Commission. The original facility covered an area of approximately 2,520 acres. A buffer zone was added in 1974-1975 to enlarge the plant to its present size of approximately 6,550 acres The buffer zone had been used for grazing cattle and horses and is enclosed within a cattle fence which is posted with signs indicating restricted access. Two office buildings, a warehouse, firebreaks, holding ponds along three watercourses, environmental monitoring instrumentation, a sanitary landfill area, a salvage yard, power lines, inactive gravel pits, clay pits and two target ranges are located in the buffer zone.

Major facility structures are located in a 400-acre controlled area near the center of the property. Production, research and

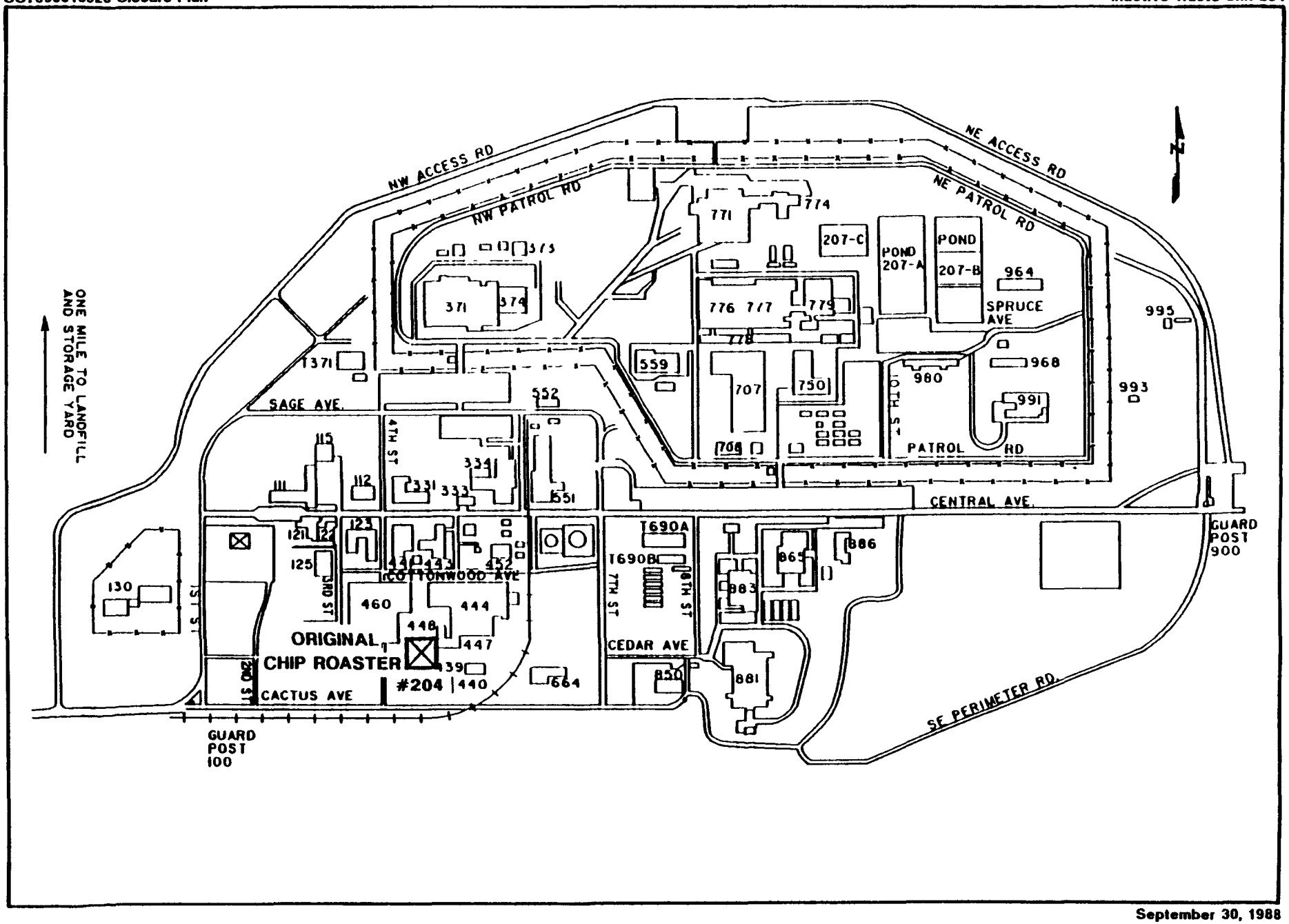
development facilities at the plant are located in the controlled area which contains approximately 134 structures with a combined floor space of approximately 2.67 million square feet.

1.2 Content of Closure Plans

This document contains the closure plan for the inactive solid waste management unit (SWMU) Reference number 204. This unit is the Original Uranium Chip Roaster, located in Building 447. The location of this unit within the Rocky Flats complex is shown in Figure 2.

The objective of this closure plan is to meet the performance standards for closure specified in 6 CCR 1007-3, Section 265.111. The standards require that a facility must be closed in a manner that

- minimizes the need for further maintenance, and
- controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or the atmosphere.



September 30, 1988

Figure 2 ORIGINAL CHIP ROASTER LOCATION MAP

1.3 Description of the Original Uranium Chip Roaster, Bldg 447 SWMU Reference No 204

1.3.1 Dates of Operation

The uranium chip roaster was operated from 1956 through the current time; however, RCRA regulated solvents have been eliminated from the processes generating the chips Therefore, hazardous wastes are no longer managed in the chip roaster

1 3.2 Location and Size of Facility

The original uranium chip roaster is located in Room 502 of Building 447 and is constructed of steel casing lined with alumina refractory brick The roaster is cylindrical in shape with a diameter of 5'6" and a height of 7'4" Figures 3 and 4 provide a cross-section and P&ID of the original chip roaster, respectively.

1.3.3 Process Description

Elemental uranium is a pyrophoric solid that can spontaneously combust on exposure to air The uranium chip roaster oxidizes uranium to uranium oxide for the purpose of controlling its pyrophoric characteristics thereby allowing safer storage and

handling. Uranium chips are generated in the Building 444 production area. The chips are normally coated with cooling oils during the production process and then stored in 55 gallon drums before being roasted. The chips are first rinsed with hot water to remove excess oils and coolants and then fed into the entry chute of the chip roaster Chips are ignited on initial feed and sustain self-combustion throughout the roasting cycle

The uranium chips fall onto the first tier of a four tier grate system within the roaster. Each of the four tiers contain four arms which move the burning chips across the grates, causing the chips to fall through to the grate below. The four arms with paddles in the fourth tier push the uranium oxide through a hole and into a drum below. The uranium oxide is collected in thirty gallon drums and is allowed to cool for two to three days.

To prevent overloading, the feed rate is limited to three drums of chips per hour. Exhaust gases are run through a stack and into the main building filter plenum before exhaust to the atmosphere. Gases pass through three banks of HEPA filters; one in the roaster stack, and two in the main building plenum

1.3.4 Waste Types

The uranium chips were normally coated with cooling oils and solvents containing listed hazardous constituents, specifically freon TF and 1,1,1 trichloroethane. Roasting of the chips, therefore, constituted thermal treatment of hazardous waste The original chip roaster is being closed because solvents, the only RCRA regulated hazardous waste feed to the chip roaster, have been eliminated from the waste feed. Because of recent waste minimization policies implemented at the Rocky Flats Plant, hazardous constituents will no longer be used in the chip production process. The original chip roaster will be closed under RCRA and reopened as a backup unit for the new chip roaster. (Church, 1988)

1.4 Closure Plan Summary

1.4.1 Closure Plan

The original uranium chip roaster was used indirectly as a thermal treatment unit for the hazardous waste solvent constituents 1,1,1 trichloroethane and freon TF Indirect thermal treatment refers to the fact that uranium chips had, at one time, been contaminated with cutting oils containing these

hazardous constituents. Incidental thermal treatment of these constituents occurred during chip roasting

Based the physical and chemical properties of 1,1,1 trichloroethane and freon TF, and the operating temperature of the chip roaster, residual waste solvents are not expected to remain in the chip roaster or in ancillary equipment. Closure of this unit will involve sampling soot and particulate from the roasting vessel and cyclone separator (See Figures 3 and 4) for the purpose of confirming the absence of residual volatile organic compounds. Samples will be analyzed for EPA's Hazardous Substance List (HSL) volatile organic compounds and freon using EPA approved analytical methodologies and method detection limits (EPA Method 8240). If the results of the samples indicate that no HSL volatile organic compounds exist in detectable levels, the unit will be certified closed. If residual volatile organic contamination is found in detectable levels, the closure plan will be amended within 90 days, and will detail subsequent closure steps.

1.4.2 Closure Schedule

The estimated time required for closure activities at the original uranium chip roaster is illustrated in Figure 5 As shown in Figure 5, sampling of the roaster and ancillary

equipment will be performed within 30 days of Agency approval. The schedule allows for analytical reporting time of 45 days following the collection of samples and 15 additional days to evaluate sample results. If the analytical data indicates that additional closure steps are necessary, an amended closure plan will be submitted within 90 days detailing subsequent closure steps. If analytical data reveals no residual contamination above detectable levels, certification of closure will follow within 30 days

1.4.3 Justification for Extension of Schedule

6 CCR 1007-3, Section 265.113(b), and 40 CFR Part 265.113 state, in part, that closure activities will be completed within 180 days after approval of the closure plan unless closure activities will, by necessity, take longer than 180 days to complete If closure activities will take longer than 180 days, then steps must be taken to prevent threats to human health and the environment from the unclosed facility.

The schedule for closure activities for the Original Uranium Chip Roaster exceeds the time required by the regulations An extended closure schedule is required due to the length of time necessary to sample, evaluate data and if necessary decontaminate. Further, per 6 CCR Part 265.113 and 40 CFR Part 265.113, all

steps to prevent threats to human health and the environment must be taken To comply with these requirements, the following steps will be taken.

1.4.4 Protection of Human Health and the Environment

Threats to human health and the environment are prevented by the routine monitoring activities conducted at Rocky Flats and by restricted access to the facility Specific details of the routine monitoring program are summarized in the "Annual Environmental Monitoring Report" (Rockwell, 1987). This document is reviewed and updated on an annual basis. Brief discussions of the monitoring activities that are conducted and the security procedures at the plant are presented below.

The routine environmental monitoring program includes the sampling and analysis of airborne effluents, ambient air, surface and ground water, and soil. External penetrating gamma radiation exposures are also measured using thermoluminescent dosimeters Samples are collected from on-site, boundary and off-site locations

Particulate and tritium sampling of building exhaust systems is conducted continuously. For immediate detection of abnormal conditions, ventilation systems that service areas containing plutonium are equipped with Selective Alpha Air Monitors. These monitors trigger an alarm automatically if out-of-tolerance conditions are experienced Particulate samples are collected from ambient air samplers operated continuously on site. The ambient air samples are analyzed for Total Long-Lived (TLL) Alpha activity or for plutonium activity. There are currently 51 of these ambient air samplers Twenty-three are located within and adjacent to the Rocky Flats exclusion area, 14 are located along or near the plant's perimeter and 14 are located in nearby communities.

The majority of the water used at the RFP for plant process operations and sanitary purposes is treated and evaporated and/or reused for cooling tower makeup or steam plant use. The discharge of water off-site is minimized to the greatest extent possible. Water discharges from the Rocky Flats Plant are monitored for compliance with appropriate CDH standards and EPA National Pollutant Discharge Elimination System (NPDES) permit limitations. Surface runoff from precipitation is collected in surface water control ponds and discharged off site after monitoring. Routine water monitoring is conducted for two downstream reservoirs and for drinking water sources in nine

communities. Ground-water monitoring was conducted during 1987 at approximately 160 ground-water sampling locations.

Soil samples were collected during 1987 from 40 sites located on radii from Rocky Flats at distances of 1.6 and 3.2 kilometers (1 and 2 miles). The purpose of this soil sampling is to determine if there are any changes in plutonium concentrations in the soil around the plant.

When higher concentrations than usual are found in any of the routine monitoring activities or when out-of-compliance conditions are identified, the cause of the problem is investigated. If the Original Uranium Chip Roaster is found to be the cause of an out-of-compliance condition, this closure plan will be revised within 30 days.

Access to the plant is limited by:

- a three-strand barbed wire cattle fence surrounding the facility (Figure 1) posted to identify the land as a government reservation/ restricted area,
- guards patrolling the controlled area and the PSZ 24 hours per day, and
- surveillance by security cameras 24 hours per day.

The existing fences and gates are operated and maintained by the U.S. Department of Energy.

The monitoring and security measures outlined above are designed to protect human health and the environment by threats posed by the plant as a whole. In addition, they protect human health and the environment from threats posed by the Original Uranium Chip Roaster.

1.5 Administration of Closure Plan

The closure plan for the Original Uranium Chip Roaster will be kept at the Rocky Flats Area Office, Building 115, U.S. Department of Energy. The person responsible for storing and updating this copy of the closure plan is:

Mr. Albert E. Whiteman
Area Manager

His address and phone number are:

U.S. Department of Energy
Rocky Flats Plant
P.O. Box 928
Golden, Colorado 80402
Phone: (303) 966-2025

Mr. Whiteman is also responsible for updating other copies of the closure plan held off-site by sending additions or revisions by registered mail.

1.6 Closure Cost Estimates and Financial Assurance

State and Federal governments are exempt from the financial requirements imposed by Subpart H of 6 CCR 1007-3, Section 264 140(c). Because the Rocky Flats Plant is a federally-owned facility, no cost estimates or financial assurance documentation are required. However, cost estimates are presented for planning, budgeting and informational purposes. The cost estimate for performing closure on the Original Uranium Chip Roaster are presented in Table 1 and were developed based on a worst case scenario where the roaster vessel, and all associated ancillary equipment are decontaminated. Waste liquids and solids generated during decontamination are considered to be low-level mixed waste for purposes of the cost-estimates. These estimates should in no way be construed as binding.

The total closure cost estimate, assuming the chip roaster and ancillary equipment will be decontaminated, is $121,800

TABLE 1

CLOSURE COST ESTIMATES FOR ORIGINAL URANIUM CHIP ROASTER

TASK	COST ESTIMATE
Initial Sampling and Analyses (six samples for HSL VOC)	$ 7,500
Review of Data/Preparation of Amended Closure Plan	$ 14,400
Site Reconnaissance/Planning	$ 2,400
Decontamination Equipment, Labor, Monitoring	$ 25,000
Reanalysis	$ 7,500
Disposal	$ 50,000
Contingency	$ 15,000
	$ 121,800

2.0 REMOVAL OF WASTE INVENTORY

There are and will be no containers or wastes in treatment or storage for more than 90 days at the Original Uranium Chip Roaster during closure; therefore, there is no inventory to be removed

3.0 FACILITY DECONTAMINATION

3.1 Decontamination and Monitoring

3 1.1 Introduction

This section provides a discussion of the general procedures used for decontamination and monitoring. Surfaces that were in contact with hazardous waste or had the potential for coming in contact with hazardous waste will be initially screened for gross radioactive contamination If the area is found to meet Rocky Flats criteria for acceptable levels of radioactive contamination, decontamination procedures will focus on the removal of hazardous waste constituents

3 1.2 Radioactive Screening Procedures

3.1 2.1 Surveying for Alpha

Potentially contaminated surfaces will be surveyed for removable alpha contamination by performing swipe tests and counting the swipe in a scintillation-type counter instrument To be considered clean, the floor must have removable alpha contamination less than 20 disintegrations per minute (dpm) per one hundred square centimeters.

Surfaces will also be surveyed for non-removable or fixed contamination using the air proportional-type alpha survey instrument The direct count must be less than detectable, approximately 500 dpm per 50 square centimeters, to be considered clean.

3 1.2 2 Surveying for Beta-Gamma

The surface will be surveyed for removable beta-gamma contamination by performing swipe tests and counting the swipe in a beta-sensitive smear counter To be considered clean, the surface must have removable beta-gamma contamination less than

the activities defined in Table 2 (Rockwell, 1985).

The surface will also be surveyed for fixed beta-gamma contamination using a Ludlum Model 31, Geiger-Mueller type instrument The instrument probe will be placed close to and moved slowly over the surface and the count-rate reading noted The reading must be less than those defined in Table 2 (Rockwell, 1985)

TABLE 2

ACCEPTABLE SURFACE CONTAMINATION LEVELS

(U.S. Department of Energy, 1985)

Nuclide[1]	Average[2],[3]	Maximum[2],[4]	Removable[2],[5]
U-nat, U-235, U-238, and Associated Decay Products	5,000 dpm alpha per 100 cm^2	15,000 dpm alpha per 100 cm^2	1,000 dpm alpha per 100 cm^2
Transuranics, Ra-226, Ra-288, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 dmp beta - gamma/100 cm^2	15,000 dpm beta-gamma/100 cm^2	1,000 dpm beta-gamma/100 cm^2

TABLE 2 (cont'd.)

ACCEPTABLE SURFACE CONTAMINATION LEVELS

(U.S. Department of Energy, 1985)

Notes:

(1) Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

(2) As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

(3) Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

(4) The maximum contamination level applies to an area of not more than 100 cm^2.

(5) The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent level should be reduced proportionally and the entire surface should be wiped.

3.2 Closure of the Original Uranium Chip Roaster

The Original Uranium Chip Roaster will only undergo RCRA closure due to the elimination of freon and 1,1,1 trichloroethane. Rockwell intends to evaluate the extent of residual contamination (RCRA hazardous constituents) in the chip roaster and to perform decontamination, if needed, to remove these contaminants After RCRA closure has been certified, the unit will continue to operate as a non-RCRA waste treatment unit for uranium chips. Therefore, decontamination of this unit, with respect to uranium, will not be conducted.

3 2.1 Sampling and Analysis

The only potential RCRA hazardous constituents relating to closure of the chip roaster are freon and 1,1,1 trichloroethane. Because these contaminants are volatile they are not expected to remain as residual contaminants in the roaster vessel or any ancillary equipment. To confirm this theory, samples of soot from the roaster vessel, and the cyclone separators will be sampled and analyzed for EPA's Hazardous Substance List (HSL) volatile organic compounds, plus freon TF A minimum of six samples from the roaster vessel and the cyclone separator will be

analyzed using EPA method 8240 Areas that reveal contamination above the method detection limit will be decontaminated according to the procedures outlined below. Pre-filters and H E.P A filters serving the exhaust gases from the roaster will be replaced. Used filter media will be stored and disposed as mixed waste

3 2.2 Ancillary Equipment

Ancillary equipment associated with the Original Uranium Chip Roaster that may need closure under this plan include:

- o gear reducer
- o flue duct
- o cyclone separator
- o plenum pre-filter
- o heat exchanger
- o blower
- o H.E.P.A. filters

3.2.3 Decontamination

Surfaces found to contain freon of 1,1,1 trichloroethane residual concentrations in excess of the analytical method detection limits will undergo decontamination using foam. The concrete

floors will also be decontaminated by foam cleaning if they are found to be contaminated with freon or 1,1,1 trichloroethane The foam holds the decontamination agents at the surface, permitting them to act on the contaminants, lifting them into the foam. The foam with the suspended contaminants, is then directly removed from the surface by vacuum techniques

A commercial decontamination agent consisiting of inhibited acidic powder containing oxalate, citrate and ammonium ions, inhibitors, and a surfactant and foam suppressant will be used This decontamination agent will remove oils, solvents, organic compounds, and low-level radioactive contaminants. The foam cleaning will conducted once and will be followed by rinsing three times.

The final rinse water will be sampled for the presence of volatile organic compounds using EPA Method 8240. If the levels are found above the method detection limit, the surface will be subjected to additional decontamination with foam The roaster vessel, ancillary equipment and flooring will be certified closed when the rinse water is found to contain non-detectable levels of the HSL volatile organic compounds

Equipment used during decontamination will be decontaminated in the Building 889 decontamination facility This facility is currently equipped to decontaminate up to moderately sized

construction equipment All rinsate will be collected and transported to a temporary holding tank. The rinsate will then be characterized for final disposition.

4.0 SITE SECURITY

The existing security measures at the Rocky Flats plant include:

- a three-strand barbed wire cattle fence surrounding the facility (Figure 1) posted to identify the land as a government reservation/restricted area,
- a fence surrounding and guards posted 24 hours per day at two gates to the controlled area of the facility (Figure 1),
- a 6-foot high chain link fence topped by 2 feet of three-strand barbed wire surrounding and guards posted 24 hours per day at gates to the perimeter security zone (PSZ),
- guards patrolling the controlled area and the PSZ 24 hours per day, and
- surveillance by security cameras 24 hours per day.

The existing security measures are sufficient to meet the requirements of 6 CCR 1007-3, Section 265.14 and 40 CFR Part 265.14

5.0 CLOSURE CERTIFICATION

5.1 Certification Requirements

Certification of closure requirements is outlined in 6 CCR 1007-3, Section 265.115 and 40 CFR 265 115:

> "When closure is completed, the owner or operator must submit to the (Department of Health/Regional Administrator) certification both by the owner or operator and by an independent registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan."

Certification by a registered professional engineer does not guarantee the adequacy of the closure procedures and does not necessarily involve detailed testing and analyses. It implies that, based on periodic facility inspections, closure has been completed in accordance with the specifications in the approved closure plan (U.S. Environmental Protection Agency, 1981).

5.2 Activities Requiring Inspections by a Registered Professional Engineer

An independent registered professional engineer will inspect sampling and decontamination activities for certification of closure.

5.3 Anticipated Schedule of Inspections by a Registered Professional Engineer

An independent registered engineer will periodically review the closure operations listed in Section 5.2 in order that a final certification of closure can be developed which states that the closure has been carried out according to the plan. The engineer will periodically obtain and review the results of chemical testing which provide a record of the progress and effectiveness of the implemented closure plan.

The independent engineer and the owner will, at the end of closure, inspect the site and certify that the closure plan was carried out as described Prior to final certification, deficiencies noted by the engineer will be corrected When deficiencies have been corrected, the engineer will issue a written report to the regulatory agencies certifying that the facility has been closed according to this closure document

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U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Third Edition, SW-846, November 1986, Office of Solid Waste and Emergency Response

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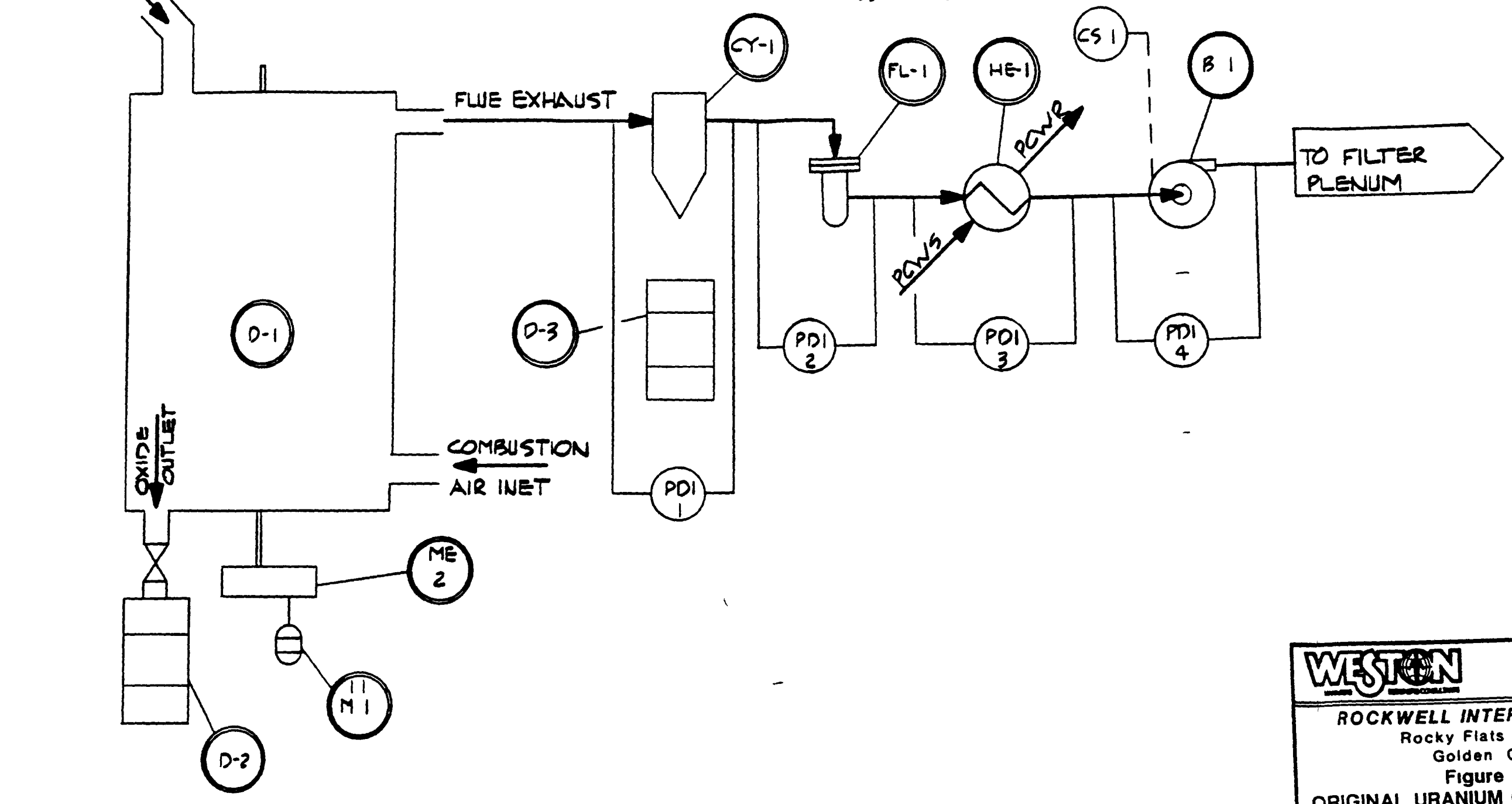
D-1	D 2	M-1	ME- 1	V-1	CS-1
CHIP ROASTER	OXIDE BARREL	DRIVE MOTOR	GEAR REDUCER	OXIDE DISCHARGE VALVE	ON/OFF CONTROL SWITCH

D-3	CY-1	FL-1	HE-1	B-1
OXIDE BARREL	CYCLONE	FILTER BANK	HEAT EXCHANGER 115,000 BTU/ HR	BLOWER 500 CFM @ 42" WC



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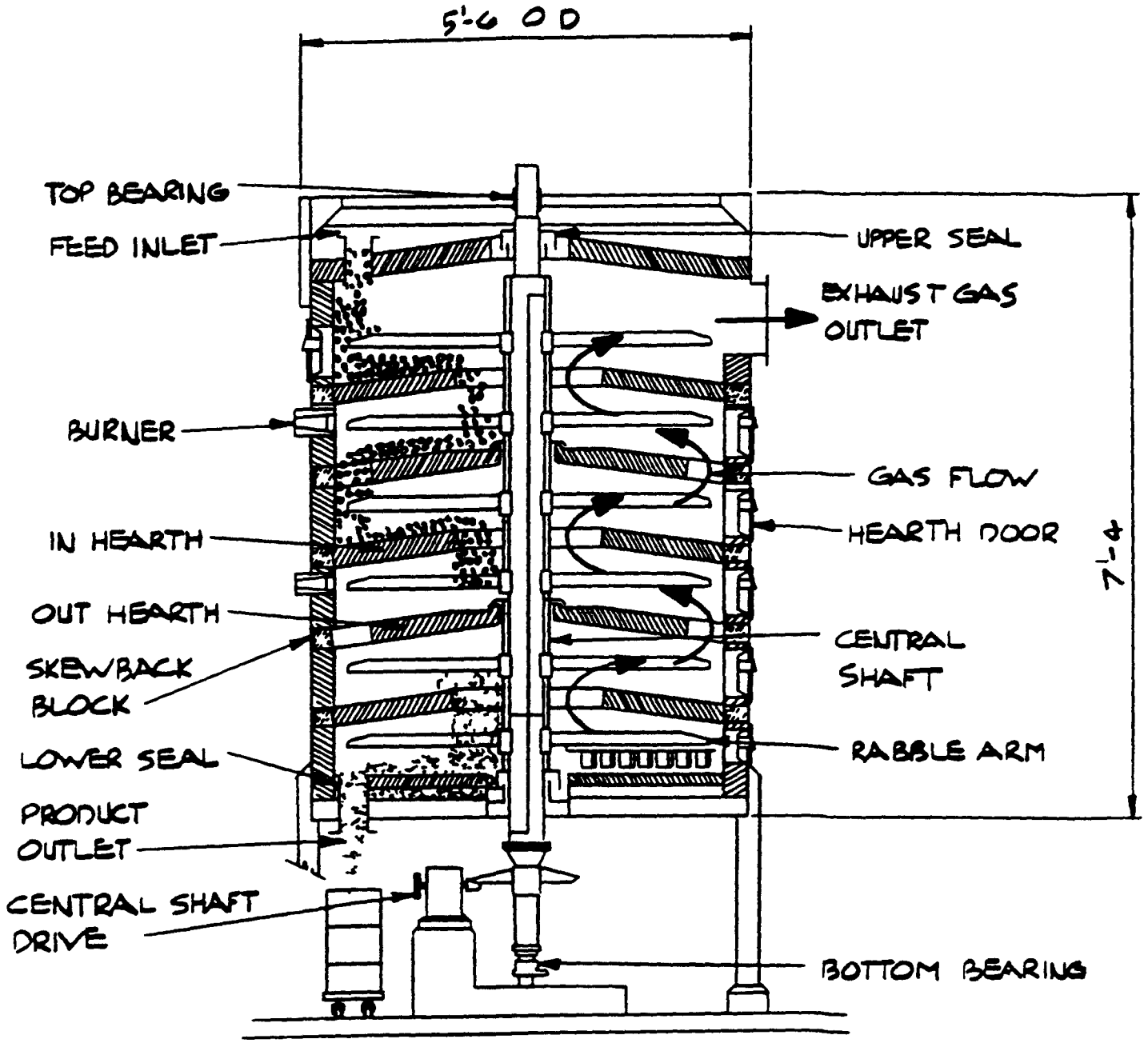
ROCKWELL INTERNATIONAL
Rocky Flats Plant
Golden CO

Figure 4
ORIGINAL URANIUM CHIP ROASTER
P & ID
Bldg 447

BLDG 44
PROD 3
CA

September 30 1988



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Golden CO

Figure 3
ORIGINAL URANIUM CHIP ROASTER
Bldg 447

BLDG 44
ROOM 32
CAT